CHAPTER 2
OPERATING INSTRUCTIONS

Section I. PREPARATION FOR OPERATION

2-1. PRELIMINARY INSPECTION INSTRUCTIONS.

a. Perform *Before* operation Operator/Crew Preventive Maintenance Checks and Services (PMCS) (see TM 08594A-12&P).

b. Inspect all vehicle connectors for dirt and damage prior to installing system components.

2-2. VEHICLE PREPARATION INSTRUCTIONS.

a. Position Light Armored Vehicle (LAV) on level ground 1000 m from a target panel containing a retro reflector unit.

b. Perform Pre-mission checks IAW TM 08594A-10/1A. An operational vehicle is required for PGS to operate properly.

c. Adjust contrast and brightness of thermal picture in preparation for TBOS DIM36TH alignment.

d. Confirm boresight status (see TM 08594A-10/1A).

WARNING

Vehicle master switch and turret power must be OFF before connecting or disconnecting system components/cables. Failure to follow this warning may cause turret or 25 mm gun movement, resulting in injury or death to personnel.

e. Turn vehicle master switch OFF (see TM 08594A-10/1A). Set TURRET DRIVE LOCK to LOCKED position and turn turret power OFF (see TM 08594A-10/1A).

f. Using tool assembly in PGS storage case, loosen but do not remove two setscrews. Remove two screws and four washers on commander's daysight brow pad and remove brow pad.

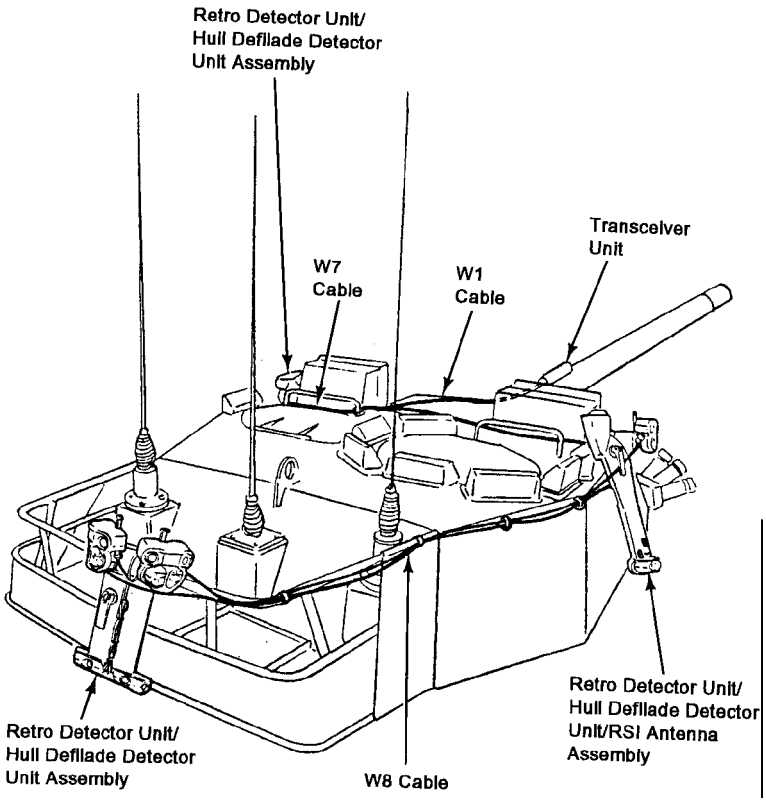
g. Remove lid on HE ammunition box (see TM 08594A-10/1A).

h. Remove HE ammunition feed chute (see TM 08594A-10/1A).

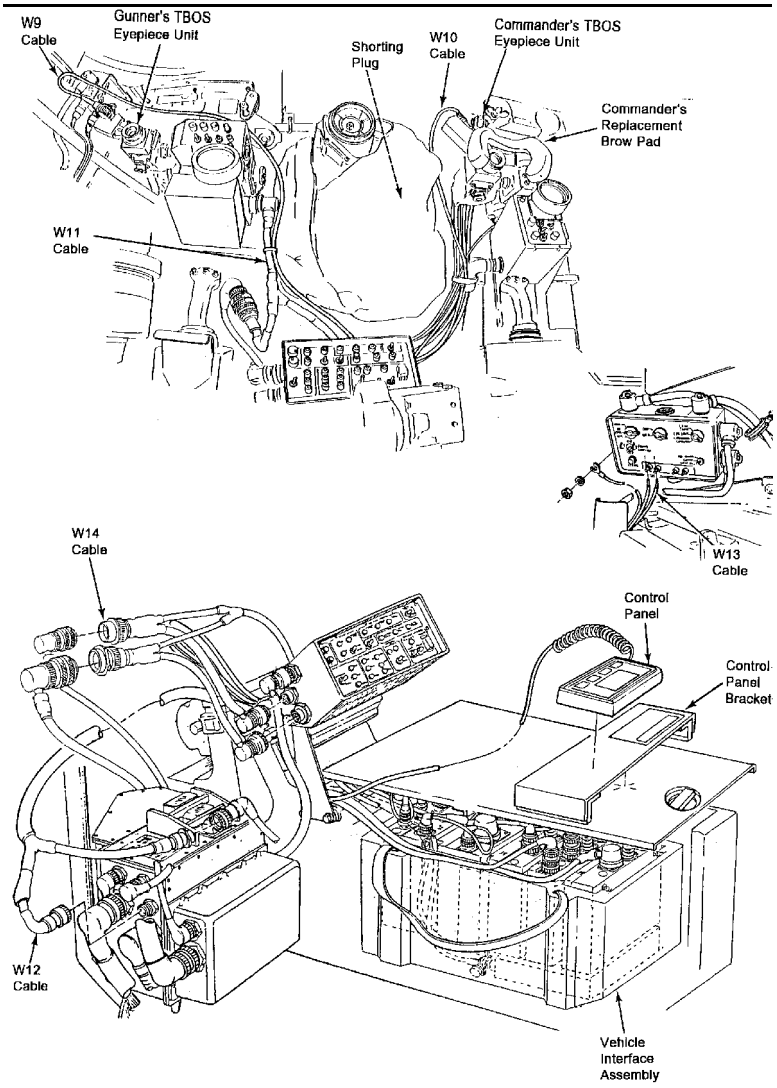
i. Ensure AP and HE feed shaft stop knobs on 25 mm gun are IN (see TM 08594A-10/1A).

j. Remove binocular case storage bracket on turret exterior, if equipped (see TM 08594A-10/1A).

2-3. INSTALLATION OF EXTERIOR COMPONENTS AND CABLES.



2-4. INSTALLATION OF INTERIOR COMPONENTS AND CABLES.



2-5. ALIGNMENT PROCEDURES.

NOTE

- **Alignment MUST be performed in strict accordance with instructions provided to ensure proper training results.**

- **Alignment can be performed at any distance between 200 and 4000 meters. For best results, select a distance approximately 1000 meters.**

a. **Alignment Target Placement.**

(1) Position a target panel as close to 1000 meters away from the vehicle as possible. Target panel should be placed so that 25 mm gun is over the front of the vehicle when gun is aligned with target.

(2) Mount a retro reflector unit on the target panel.

b. **Vehicle Preparation.**

(1) Set master switch to ON (see TM 08594A-10/2).

(2) Place turret power ON (see TM 08594A-10/1A).

(3) Place either gunner's or commander's DIM36TH sight ON (see TM 08594A-10/1A).

(4) Set TURRET DRIVE LOCK to UNLOCKED position (see TM 08594A-10/1A).

(5) Place DRIVE SELECT LEVER to POWERED position (see TM 08594A-10/1A).

(6) Position vehicle on level ground (see TM 08594A-10/1A).

(7) Release locking handle of TBOS commander's and gunner's eyepiece unit (see paragraph 2-4). Focus sight picture in commander's and gunner's eyepiece (see TM 08594A-10/1A). Lock locking handle of TBOS commander's and gunner's eyepiece units.

c. **Cant Alignment.**

(1) Select AL and press ENTER.

(2) On DIM36TH sight, select narrow FOV (see TM 08594A-10/1A).

(3) Select CA and press ENTER.

(4) Press ENTER and read pop-up screen.

(5) Press ENTER and read pop-up screen.

(6) Press ENTER and read pop-up screen.

NOTE

Cant angle of transceiver unit is displayed on control panel.

(7) Press ENTER.

(8) Rotate turret in either direction to maximum cant angle and note azimuth reading.

(9) Rotate turret 1600 mils in either direction from maximum cant angle.

(10) Have crewmember lower transceiver unit locking handle and slowly rotate transceiver unit until control panel displays cant angle of 0° ±0.5°.

CAUTION

Ensure that transceiver unit is properly LOCKED into mounting bracket by checking that transceiver unit locking handle is in raised position. Failure to perform this check may result in transceiver unit falling out of mounting bracket and becoming damaged.

NOTE

Transceiver unit is properly installed when locking handle in locked position is flush with mounting bracket.

(11) Have crewmember raise transceiver unit locking handle to locked position.

(12) Press ESC.

d. **Laser Alignment.**

(1) Select LA and press ENTER.

(2) Using gunner's controls, lay boresight cross of 25 mm gun reticle on the center of the retro reflector unit, mounted on the target panel. Press ENTER.

(3) Select R and press ENTER.

WARNING

Transceiver unit is a laser safety Class 3A which means it is conditionally eye safe. DO NOT view transceiver unit during training exercise with an aided eye, i.e. optics which magnify from a distance less than 25 m.

NOTE

- **DO NOT adjust lay of gun at any time when performing steps 4 and 5.**
- **Ensure that only one retro reflector unit is visible within field of view.**
- **The target hit deflection and range-to-target are displayed on the control panel display screen after pressing ENTER three times.**

(4) Select M and press ENTER.

(5) Press ENTER a minimum of three times.

NOTE

If SAVE is selected prior to three laser measurements, a pop-up screen appears.

(6) Select S.

(7) Press ENTER.

NOTE

If ESC is pressed while a pop-up screen is displayed, measurement is not saved. A pop-up screen appears.

(8) Press ESC.

e. **TBOS Gunner Alignment.**

(1) Select a target with a dark background to allow for better observation of TBOS effects.

(2) Select TG and press ENTER. A reticle pattern with alignment dot is presented in sight.

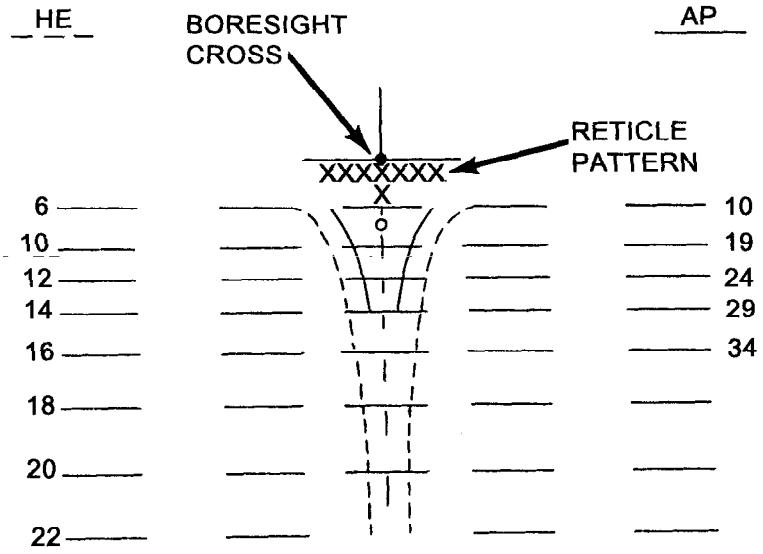
(3) Adjust focus on TBOS eyepiece unit until reticle is sharp.

(4) Select R and press ENTER.

NOTE

When alignment (AL) is selected, TBOS alignment steps are displayed on control panel.

(5) Select AL and press ENTER. Only a reticle pattern is presented in sight.



2-5. ALIGNMENT PROCEDURES (Con't).

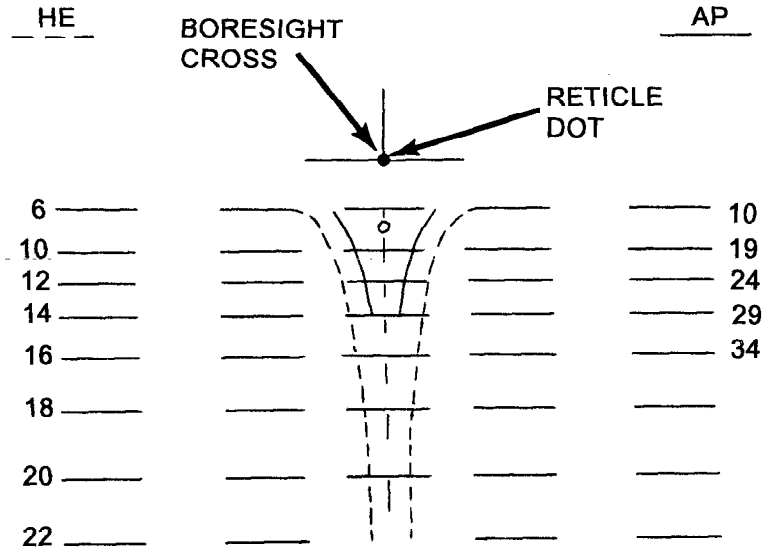
(6) Using up/down arrow buttons, rotate reticle pattern until aligned with boresight cross.

NOTE

Reticle pattern is properly positioned when it rests over boresight cross. Vertical line in reticle pattern MUST point downward.

(7) Press ENTER to save and continue alignment.

(8) Using up/down arrow buttons, adjust position of TBOS dot until dot is level with boresight cross.



(9) Press ENTER to save and continue alignment.

(10) Using left/right arrow buttons, adjust position of TBOS dot until dot is on boresight cross.

(11) Press ENTER to save.

NOTE

After ENTER is pressed, the TBOS alignment reticle is displayed. If not properly aligned with sight reticle, repeat steps 3 through 10.

(12) Press ESC.

f. **TBOS Commander Alignment.**

(1) Select a target with a dark background to allow for better observation of TBOS effects.

(2) Select TC and press ENTER. A reticle pattern with alignment dot is presented in sight.

(3) Adjust focus on TBOS eyepiece unit until reticle is sharp.

(4) Select R and press ENTER.

NOTE

When alignment (AL) is selected, TBOS alignment steps are displayed on control panel.

(5) Select AL and press ENTER. Only a reticle pattern is presented in sight (see TBOS Gunner Alignment for reticle).

NOTE

Reticle pattern is properly positioned when it rests over boresight cross. Shorter vertical line in reticle pattern MUST point downward.

(6) Using up/down arrow buttons, rotate reticle pattern until aligned with boresight cross.

(7) Press ENTER to save and continue alignment.

(8) Using up/down arrow buttons, adjust position of TBOS dot until dot is level with boresight cross.

(9) Press ENTER to save and continue alignment.

(10) Using left/right arrow buttons, adjust position of TBOS dot until dot is on boresight cross (see TBOS Gunner Alignment for reticle).

(11) Press ENTER to save.

NOTE

After ENTER is pressed, the TBOS alignment dot is displayed. If not properly aligned, repeat steps 3 through 10.

(12) Press ESC.

g. **Gunner's DIM36TH Alignment.**

(1) Select TD and press ENTER. An alignment dot is presented in DIM36TH sight.

(2) Select R and press ENTER.

2-5. ALIGNMENT PROCEDURES (Con't).

NOTE

When alignment (AL) is selected, DIM36TH alignment steps are displayed on control panel.

(3) Select AL and press ENTER. Alignment dot is presented in DIM36TH sight (see TBOS Gunner Alignment for reticle).

(4) Using up/down arrow buttons, adjust position of TBOS dot until dot is level with boresight cross.

(5) Press ENTER to save and continue alignment.

(6) Using up/down arrow buttons, adjust position of TBOS dot until dot is on top of boresight cross.

(7) Press ENTER to save.

NOTE

After enter is pressed, DIM36TH alignment dot is displayed. If not properly aligned, repeat steps 2 through 7.

(8) Press ESC twice.

2-6. SETUP PROCEDURES.

a. **Backlight.**

(1) Select SU and press ENTER.

(2) Select BL and press ENTER.

(3) Press left arrow button to turn backlight ON or right arrow button to turn backlight OFF. Press ENTER.

(4) Press ESC.

b. **Contrast.**

(1) Select SU and press ENTER.

(2) Select CO and press ENTER.

(3) Use left/right arrow buttons to change contrast and press ENTER.

(4) Press ESC.

Section II. OPERATION OF PGS

2-7. GENERAL.

a. This section describes operation of the Precision Gunnery System (PGS). The crew operates the vehicle weapons systems in their normal mode of operation and crew input to PGS is not required.

b. The PGS training exercise is set up by the instructor using the Training Data Retrieval System (TDRS) computer unit. The instructor sets the ammunition allowance. Refer to TM 9-6920-711-12&P-1.

c. Target engagement feedback is provided by the PGS in the form of audio tones and visual effects of tracer and burst. When simulating firing on a target vehicle, the appropriate sound signature will accompany the firing of the weapon. In the sight, the gunner can see the visual effects of tracers, burst on target, and burst on ground. Listed are the audio and visual effects provided during operation of the PGS.

(1) Audio tones and control panel messages indicate to target vehicles that they are under fire or destroyed.

2-7. GENERAL (Con't).

(2) Strobe lights indicate to firing vehicle that the target is hit or destroyed.

2-8. CREW OPERATIONS.

NOTE

- **During an upload sequence, PGS can transfer ammunition from hull to turret until turret rack is full or if remaining hull ammunition is not enough to fill the turret rack, the remaining ammunition is transferred.**
- **The remaining time of upload appears on control panel display screen.**
- **When ammunition has been uploaded, COMPLETED will appear on control panel display screen.**
- **Upload time is programmed on TDRS memory card by training controller.**
- **If ESC is pressed during an upload sequence, process is stopped and ammunition is not transferred.**
- **When upload is completed for one ammunition type, press ESC.**

a. Set master switch to ON (see TM 08594A-10/2), power up turret and DIM36TH sight (see TM 08594A-10/1A).

b. **Ammunition.** The crew can monitor remaining ammunition during an exercise using the control panel.

(1) Select SI and press ENTER.

2-8. CREW OPERATIONS (Con't).

(2) Select RM and press ENTER.

(3) To monitor main gun ammunition, select MW.

NOTE

Perform step (4) to upload main gun ammunition.

(4) Using up/down arrow buttons, select ammunition to be uploaded and press ENTER.

(5) To monitor coax ammunition, select CO and press ENTER.

NOTE

Perform step (6) to upload coax ammunition.

(6) Using up/down arrow buttons, select ammunition to be uploaded and press ENTER.

(7) Press ESC twice.

2-9. RESULTS.

a. **General.** Results of the training exercise can be displayed numerically or graphically, or the result presentation can be turned off.

b. **Numerical Presentation.**

(1) Numerical presentation allows for immediate feedback and result presentation of hit coordinates and type of ammunition.

(2) Results are presented in a pop-up screen on the control panel.

2-9. RESULTS (Con't).

(3) A pop-up screen appears until a new result is displayed or a control panel button is pressed.

c. **Graphics Display (GD).**

(1) Graphic presentation allows for immediate feedback and is used for panel gunnery training exercises where display of the hit in relation to the target outline is preferred over actual hit coordinates.

NOTE

This screen identifies the target silhouette and hit position (x) in relation to target center of mass (+).

(2) Select SI and press ENTER.

(3) To view results graphically, select GD and press ENTER. Graphics display will show the target template of the ammo fired and round impact point.

(4) Press ESC to exit graphics display.

d. **Result Presentation Off.** For force-on-force exercises, the instructor can program the TDRS memory card to store the training results without displaying them on the control panel. This method of presentation requires the crew to engage their targets based on visual effects of tracers and burst provided in the sights.

2-10. DESCRIPTION OF HIT RESULT.

a. PGS provides results for firing vehicles and target vehicles.

b. A firing result provides information in four areas:

2-10. DESCRIPTION OF HIT RESULT (Con't).

(1) Engagement evaluation.

(a) **HIT**. A HIT presentation indicates that the simulated round has hit the target. PGS assumes the target to be either a BMP front for a 25 mm gun round, or a kneeling soldier for coax rounds. If the control panel indicates HIT, MILES codes are transmitted to enable the laser target interface device (LTID) to activate and engage MILES equipped targets.

(b) **GROUND HIT**. A GROUND HIT presentation indicates that the ammunition has fallen short of the maximum range simulated for that ammunition type. The range for the actual ground impact is presented.

(c) **MAX RANGE**. If the control panel indicates MAX RANGE, the ammunition has not passed a target within the transceiver unit field of view, or has passed above the target and reached the maximum simulated range of the ammunition without landing on the simulated ground plane.

(2) Elevation and azimuth impact point on target in relation to center of mass.

(3) Actual range, in meters, to target.

(4) Type of ammunition fired.

2-11. TARGET RESULT PRESENTATION.

NOTE

During a force-on-force exercise, vehicle commander must check control panel for correct action if a HIT indication is announced by vehicle intercom.

2-11. TARGET RESULT PRESENTATION (Con't).

A target result provides information in three areas:

a. Effect of incoming round on vehicle (target system evaluation).

(1) **NEAR MISS**. A projectile has passed close to the vehicle. The crew can continue to fight.

(2) **HIT**. The vehicle is hit, but not damaged. The crew can continue to fight.

(3) **MOBILITY KILL**. The vehicle is damaged and immobilized by a hit. If the control panel indicates MOBILITY KILL, the crew must stop vehicle within 30 seconds or the vehicle will be permanently killed. When a vehicle has suffered a mobility kill, the crew can continue to engage targets with their weapons from a standstill position.

(4) **WEAPON KILL**. The vehicle is hit and the weapon system is damaged. The crew can move the vehicle, but cannot fire any weapons.

(5) **KILL**. The vehicle is hit and has sustained a catastrophic kill. The crew cannot move the vehicle or fire any weapons.

b. Elevation and azimuth impact point on vehicle in relation to center of mass.

c. Aspect angle of incoming round. The aspect angle is divided into 12 sectors according to the clock.

2-12. AUDIO INDICATIONS.

a. **General** . The system uses sound to indicate to the crew that different events have taken place. The audio indications can be divided into firing system, target system, and system error audio indications.

b. **Audio Indications of Firing System.** During loading and firing of ammunition, the following audio indications are heard through the vehicle intercom:

(1) Firing of 25 mm gun.

(2) Firing of coax machine gun.

c. **Audio Indications of Target System.** When a PGS system is fired upon from other simulator-equipped vehicles, the vehicle intercom indicates that the vehicle is being fired upon.

(1) **NEAR MISS.** If the vehicle had a near miss, two long "beeps" followed by a voice command of “Near Miss” are transmitted on the vehicle intercom.

(2) **HIT (NO KILL).** If the vehicle is hit by a round, but not killed, 4-6 “beeps” followed by a voice command of “Hit” are transmitted on the vehicle intercom.

NOTE

If panel gunnery training is used, the target system is auto-activated after 5 seconds. The audio indication stops and the system is operational. The kill is stored on the TDRS memory card together with auto-activation for After Action Review (AAR).

2-12. AUDIO INDICATIONS (Con't).

(3) **HIT (MOBILITY KILL).** If the vehicle is hit by a round and the vehicle is immobilized, 4-6 "beeps" followed by a voice command of "Mobility Kill" are transmitted on the vehicle intercom.

(4) **HIT (WEAPON KILL).** If the vehicle is hit by a round and the weapon system is immobilized, 4-6 "beeps" followed by a voice command of "Weapon Kill" are transmitted on the vehicle intercom.

(5) **KILL.** If the vehicle is hit by a round and killed, a voice command of "Kill" followed by "beeps" for 30 seconds are transmitted on the vehicle intercom.

d. **System Errors.** Verbal audio indication of "System Error, Check Control Panel" is provided through vehicle intercom for system errors.

2-13. VISUAL INDICATIONS OF TARGET SYSTEM.

The target system indicates the effect of an engagement with the retro detector unit strobe lights. The effect directs the gunner/commander's further engagement of the target. The following visual indications are given by the target system:

a. **NEAR MISS.** If a target receives a near miss, retro detector unit strobe light blinks 2 times.

NOTE

Weapon kill and mobility kill are also indicated with 4-6 indicators.

b. **HIT.** If the target is hit, but not killed, retro detector unit strobe light blinks 4-6 times.

2-13. VISUAL INDICATIONS OF TARGET SYSTEM (Con't).

NOTE

If panel gunnery training is used, the target system is auto-activated after 5 seconds. The indication stops and the system is operational.

c. **KILL.** If the target is hit and killed by a round or by a control gun (CGUN), retro detector unit strobe light blinks continuously until the system is reset by the CGUN.

2-14. CGUN INDICATIONS DURING OPERATION.

NOTE

Refer to TM 9-6920-711-12&P-1 for more information on the CGUN.

a. **CGUN KILL Message.** The instructor has the capability to kill vehicles during an exercise using the CGUN. If CG KILL appears on the control panel, the crew must stop the vehicle and await further orders. The CG KILL message, together with the time, is stored on the TDRS memory card for AAR.

b. **CGUN RESET Message.** The instructor has the capability to restore vehicles which have been killed during an exercise. If a vehicle is killed then fired upon by a CGUN using RESET, the control panel stops indicating KILL and the strobe light and vehicle intercom indication are inhibited. A basic load of ammunition is given to the vehicle (ammunition amount defined on TDRS memory card) together with the capability to fire. The time also appears with the RESET message and is stored on the TDRS memory card for AAR.

2-14. CGUN INDICATIONS DURING OPERATION (Con't).

c. **CGUN TEST, Controller Access, TIME MARK Messages.** The vehicle crew does not have to respond to all CGUN functions transmitted to their vehicle. TEST, controller access, and TIME MARK are not presented on the control panel. They are stored on the TDRS memory card for AAR. The training controller receives confirmation that the CGUN message has been received by the vehicle through one indication in each retro detector unit strobe light.

2-15. TAMPER INDICATIONS.

a. PGS senses, indicates, and stores attempts to tamper with the system during combat exercises. A pop-up screen appears on the control panel when a tamper has occurred. If the tamper is not corrected within 10 seconds, a TAMPERING KILL is indicated and PGS is inoperable.

b. The following attempts to tamper are stored and indicated during COMBAT MODE exercises:

(1) **Disconnection of Retro Detector Units.** If a retro detector unit cable is removed, a tamper is indicated and the crew has 10 seconds to connect the cable before a TAMPERING KILL is indicated.

(2) **Disconnection of Hull Defilade Detector Units.** If a hull defilade detector unit cable is removed, a tamper is indicated and the crew has 10 seconds to connect the cable before a TAMPERING KILL is indicated.

(3) **Disconnection of Power.** The system stores on the TDRS memory card each time the vehicle is powered down. If the system has been switched off, it can be read during AAR.

(4) **Alteration of Control Panel Functions.** If ammunition or other training parameters are changed, it can be found during AAR.

2-15. TAMPER INDICATIONS (Con't).

(5) **Disconnection of Cables.** Any cable disconnection within the system is stored as BIT errors on the TDRS memory card and found during AAR.

(6) **Removal of TDRS Memory Card.** If the TDRS memory card is removed and inserted, it is noted on the memory card and can be seen during AAR.

2-16. SCALED TRAINING.

a. PGS has the means to provide 1/10 and 1/2 scale range gunnery training. By using scaled ranges and PGS-equipped vehicles, crews can simulate 25 mm gun and coax machine gun firing.

b. Perform vehicle preparation instructions (see paragraph 2-2).

c. Perform installation procedures (see paragraphs 2-3 and 2-4).

NOTE

- **PGS alignment can be performed with the TDRS memory card programmed for FULL scale panel gunnery, 1/2 or 1/10 scale panel gunnery.**
- **For FULL and 1/2 scale, use a boresight panel equipped with a retro reflector unit positioned as close to 1000 meters as possible.**
- **For 1/10 scale, use a boresight panel equipped with a retro reflector unit positioned as close to 120 meters as possible.**

d. Perform alignment procedures (see paragraph 2-5).

2-16. SCALED TRAINING (Con't).

e. Conduct scaled gunnery training (see paragraphs 2-7 through 2-16).

2-17. TRACKING TRAINING MODE.

a. PGS has the capability to perform tracking training exercises in panel gunnery mode against targets with a retro reflector unit installed at the center of mass of target. PGS may also perform tracking training exercises in combat mode against targets with turret installed retro reflector units.

b. Perform vehicle preparation instructions (see paragraph 2-2).

c. Perform installation procedures (see paragraphs 2-3 and 2-4).

d. Perform the following PGS alignment procedures (see paragraph 2-5).

(1) alignment target placement

(2) vehicle preparation

(3) cant alignment

(4) laser alignment

e. Perform control panel setup procedures (see paragraph 2-6).

f. Ensure that TDRS memory card has been set up for target tracking training and that tracer and burst presentation are switched off (see TM 9-6920-711-12&P-1).

g. Operation of tracking training for 25 mm gun or coax.

(1) Select ammunition (see TM 08594A-10/1A).

(2) Set WPN/ARM switch to ARM (see TM 08594A-10/1A).

NOTE

The collection of tracking data will start when gunner's or commander's palm switch is pressed and will continue until one of the following events occur: tracking time has elapsed (TDRS memory card programmed time); firing of the main gun or coax; or gunner's or commander's palm switch is released.

(3) Aim with boresight cross.

NOTE

- **Valid tracking data will only be stored if the trigger has been activated within the tracking time selected.**

- **No tracking data will be stored if the gunner or commander release the palm switch prior to activating the trigger, or selected tracking time expires.**

(4) Perform tracking training.

(5) Set WPN/ARM switch to SAFE (see TM 08594A-10/1A).

(6) To continue 25 mm or coax tracking training, repeat steps (1) through (4).